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EXAMINER	
THANGAVELU, KANDASAMY	

ART UNIT	PAPER NUMBER
2123	

DATE MAILED: 02/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/973,786	JACKSON ET AL.
	Examiner	**Art Unit**
	Kandasamy Thangavelu	2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 October 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 October 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-18 of the application have been examined.

Drawings

2. The drawings submitted on October 11, 2001 are accepted.

Abstract

3. The abstract is objected to because of the following informalities:

Lines 1-2, "A market based learning mechanism for controlling smart matter learn an appropriate organizational control structure" appears to be incorrect and it appears that it should be "A market based learning mechanism for controlling smart matter to learn an appropriate organizational control structure".

Appropriate correction is required.

Specification

4. The disclosure is objected to because of the following informalities:

Specification Page 6, Lines 4-5, "For example. Consider the case" appears to be incorrect and it appears that it should be "For example, consider the case".

Specification Page 8, Line 32 to Page 9, Line1, "That is, for the i^{th} model that if i^{th} model's weight becomes aw_i, where $0 < a_i < 1$" appears to be incorrect and it appears that it should be "That is, for the i^{th} model if i^{th} model's weight becomes aw_i, where $0 < a_i < 1$"... (something should follow).

Specification Page 9, Lines 22-23, "if the prediction error in the i^{th} model is $e_t(t+\Delta) = x_1(t + \Delta - x(t), u(t)$" appears to be incorrect and it appears that it should be "if the prediction error in the i^{th} model is $e_t(t+\Delta t) = x(t + \Delta t) - x(t)$".

Specification Page 10, Line7, ^ and $\bar{u}$ are undefined.

Specification Page 11, Lines 5-7, "The model ... would be weighted more heavily that one that does less well" appears to be incorrect and it appears that it should be "The model ... would be weighted more heavily than one that does less well".

Specification Page 11, Line 13, "disadvantage of discontinuous changes in predict leading to possible limit cycles" appears to be incorrect and it appears that it should be "disadvantage of discontinuous changes in prediction leading to possible limit cycles".

Appropriate corrections are required.

Claim Objections

5. The following is a quotation of 37 C.F.R § 1.75 (d)(1):

> The claim or claims must conform to the invention as set forth in the remainder of the specification and terms and phrases in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.

6. Claims 4, 5, 9, 12, 13, 17 and 18 are objected to because of the following informalities:

Claim 4, Line 4, "x_t (t + Δ; x(t), u(t))" appears to be incorrect and it appears that it should be "x (t + Δt; x(t), u(t))".

Claim 5, Line 3, "$w_i^{new} = (1\text{-}a)\ w_i^{old} + a\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}^{N}(\ 1/\ (e_i^2 + \sigma^2)))]$" appears to be incorrect and it appears that it should be "$w_i^{new} = (1\text{-}a_i)\ w_i^{old} + a_i\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}^{N}(\ 1/\ (e_i^2 + \sigma^2)))]$".

Claim 9, Lines 3-12, "means to predict a future behavior of a multiple actuator-sensor smart matter dynamical control system using a plurality of control system models;

means determining at least one control system model which is more successful than other models in the plurality of models in predicting future behavior of the multiple actuator-sensor smart matter dynamical control system;

means increasing the weight of the at least one more successful control system model in the plurality of control system models used to predict future behavior w of the multiple actuator-sensor smart matter dynamical control system; and

means using the at least one more successful control system model to control the multiple actuator-sensor smart matter dynamical control system" appears to be incorrect and it appears that it should be "means for predicting a future behavior of a multiple actuator-sensor smart matter dynamical control system using a plurality of control system models;

means for determining at least one control system model which is more successful than other models in the plurality of models in predicting future behavior of the multiple actuator-sensor smart matter dynamical control system;

means for increasing the weight of the at least one more successful control system model in the plurality of control system models used to predict future behavior w of the multiple actuator-sensor smart matter dynamical control system; and

means for using the at least one more successful control system model to control the multiple actuator-sensor smart matter dynamical control system".

Claim 12, Line 4, "x_t (t + Δ; x(t), u(t))" appears to be incorrect and it appears that it should be "x (t + Δt; x(t), u(t))".

Claim 13, Line 3, "$w_i^{new} = (1\text{-}a)\ w_i^{old} + a\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}^N (\ 1/\ (e_i^2 + \sigma^2)))]$" appears to be incorrect and it appears that it should be "$w_i^{new} = (1\text{-}a_i)\ w_i^{old} + a_i\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}^N (\ 1/\ (e_i^2 + \sigma^2)))]$".

Claim 17, Line 4, "x_t (t + Δ; x(t), u(t))" appears to be incorrect and it appears that it should be "x (t + Δt; x(t), u(t))".

Claim 18, Line 3, "$w_i^{new} = (1\text{-}a)\ w_i^{old} + a\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}^N (\ 1/\ (e_i^2 + \sigma^2)))]$" appears to be incorrect and it appears that it should be "$w_i^{new} = (1\text{-}a_i)\ w_i^{old} + a_i\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}^N (\ 1/\ (e_i^2 + \sigma^2)))]$".

Appropriate corrections are required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. §112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 5, 6, 7, 8, 13 and 18 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

8.1 Claim 5 states in part, "the invested amount is split between the N models according to the formula $w_i^{new} = (1-a)\ w_i^{old} + a\,[(\,1/\,(e_i^2 + \sigma^2))\,/\,(\Sigma_{i=1}{}^{N}(\,1/\,(e_i^2 + \sigma^2)))]$". The specification defines σ^2 as the estimate of noise variance, but does not describe how it is calculated.

8.2 Claim 6 states in part, "including repeating the steps within one or more selectable time periods". The specification does not describe anywhere what is meant by "predefined fashion" and "predefined relationship". The specification does not describe anywhere what steps are being repeated.

8.3 Claim 7 states in part, "including the sum of prediction error over a finite interval". The specification uses the prediction errors to compute new weight to be used for different models.

However, the specification does not describe anywhere how the sum of errors is used to improve the models.

8.4 Claim 8 states in part, "including the actuation and the error to weight new models". The specification uses the prediction errors to compute new weight to be used for different models. However, the specification does not describe anywhere how the actuation is used to weight new models.

8.5 Claim 13 states in part, "the invested amount is split between the models according to the formula $w_i^{new} = (1\text{-}a)\ w_i^{old} + a\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}^{N}(\ 1/\ (e_i^2 + \sigma^2)))]$". The specification defines σ^2 as the estimate of noise variance, but does not describe how it is calculated.

8.6 Claim 18 states in part, "the invested amount is split between the N models according to the formula $w_i^{new} = (1\text{-}a)\ w_i^{old} + a\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}^{N}(\ 1/\ (e_i^2 + \sigma^2)))]$". The specification defines σ^2 as the estimate of noise variance, but does not describe how it is calculated.

9. Claims 5, 13 and 18 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the claim in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

9.1 Claim 5 states in part, "the invested amount is split between the N models according to the formula $w_i^{new} = (1\text{-}a)\ w_i^{old} + a\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}{}^N(\ 1/\ (e_i^2 + \sigma^2)))]$". The variables a, e_i and σ are not defined in the claim.

9.2 Claim 13 states in part, "the invested amount is split between the N models according to the formula $w_i^{new} = (1\text{-}a)\ w_i^{old} + a\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}{}^N(\ 1/\ (e_i^2 + \sigma^2)))]$". The variables a, e_i and σ are not defined in the claim.

9.3 Claim 18 states in part, "the invested amount is split between the N models according to the formula $w_i^{new} = (1\text{-}a)\ w_i^{old} + a\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}{}^N(\ 1/\ (e_i^2 + \sigma^2)))]$". The variables a, e_i and σ are not defined in the claim.

10. Claims 3, 4, 6, 7, 11 and 16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

10.1 Claim 3 states in part, "using an i^{th} model includes investing a certain fraction a_i of the weight w_i, of the i^{th} model, where $0 < a_i < 1$". The term "investing a certain fraction a_i of the weight w_i, of the i^{th} model" is undefined, making the claim vague and indefinite.

10.2 Claim 6 states in part, "including repeating the steps within one or more selectable time period". The term "the steps" is undefined, making the claim vague and indefinite.

10.3 Claim 7 states in part, "including the sum of prediction error over a finite interval.". The term "including the sum of prediction error" is undefined, making the claim vague and indefinite.

10.4 Claim 11 states in part, "using an i^{th} model includes investing a certain fraction a_i of the weight w_i, of the i^{th} model, where $0 < a_i < 1$". The term "investing a certain fraction a_i of the weight w_i, of the i^{th} model" is undefined, making the claim vague and indefinite.

10.5 Claim 16 states in part, "using an i^{th} model includes investing a certain fraction a_i of the weight w_i, of the i^{th} model, where $0 < a_i < 1$". The term "investing a certain fraction a_i of the weight w_i, of the i^{th} model" is undefined, making the claim vague and indefinite.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

12. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

13. Claims 1, 6, 7, 9, 12, 14 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jacques** (U.S. Patent Application 2003/0028266) in view of **Raeth et al.** (U.S. Patent Application 2003/0065409), and further in view of **Werbos** (U.S. Patent 6,581,048).

13.1 **Jacques** teaches tuning control parameters of vibration reduction and motion control systems for fabrication equipment and robotic systems. Specifically as per claim 14, **Jacques** teaches a dynamical controller of a multiple actuator-sensor smart matter dynamical control system (Page 1, Para 0001; Page 2, Para 0010; Page 4, Para 0032); comprising:

a controller that uses at least the at least one more successful control system models to control the multiple actuator-sensor smart matter dynamical control system (Page 3, Para 0020; Page 3, Para 0022).

Jacques teaches a prediction circuit usable to predict a future behavior of the multiple actuator-sensor smart matter dynamical control system (Page 3, Para 0020; Page 2, Para 0010; Page 3, Para 0019; Page 4, Para 0032). **Jacques** does not expressly teach using a plurality of control system models. **Raeth et al.** teaches using a plurality of control system models (Page 1, Para 0012), because that allows each prediction model to receive data from one of the sensors and predict the outputs for some future data sample (Page 1, Para 0012). It would have been

obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the controller of **Jacques** with the controller of **Raeth et al.** that included using a plurality of control system models. The artisan would have been motivated because that would allow each prediction model to receive data from one of the sensors and predict the outputs for some future data sample.

Jacques teaches a success determination circuit usable to determine at least one control system model (Page 3, Para 0020; Page 3, Para 0022). **Jacques** does not expressly teach a success determination circuit usable to determine at least one control system model which is more successful than at least one other model in the plurality of models in predicting the future behavior of the multiple actuator-sensor smart matter dynamical control system. **Raeth et al.** teaches a success determination circuit usable to determine at least one control system model which is more successful than at least one other model in the plurality of models in predicting the future behavior of the multiple actuator-sensor smart matter dynamical control system (Page 1, Para 0012; Page 2, Para 0013, 0015 and 0018), because that allows the parameter values with the dynamic controller to evolve over iterations for developing effective predictions of the next samples in the data stream (Page 2, Para 0013). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the controller of **Jacques** with the controller of **Raeth et al.** that included a success determination circuit usable to determine at least one control system model which is more successful than at least one other model in the plurality of models in predicting the future behavior of the multiple actuator-sensor smart matter dynamical control system. The artisan would have been motivated because that would allow the

parameter values with the dynamic controller to evolve over iterations for developing effective predictions of the next samples in the data stream.

Jacques does not expressly teach a weight increasing circuit usable to increase the weight of the at least one more successful control system model relative to the at least one other model m. **Werbos** teaches a weight increasing circuit usable to increase the weight of the at least one more successful control system model relative to the at least one other model (Cl7, L40-46; CL72, L7-13; CL80, L42-50), because that allows specifying models with weights which can be adapted to make the model a good approximation; if it adapts over time, it learns; and the learning mechanism tries to minimize prediction errors (CL7, L42-46; CL18, L3-5). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the controller of **Jacques** with the controller of **Werbos** that included a weight increasing circuit usable to increase the weight of the at least one more successful control system model relative to the at least one other model. The artisan would have been motivated because that would allow specifying models with weights which could be adapted to make the model a good approximation; if it adapted over time, it would learn; and the learning mechanism would try to minimize prediction errors.

13.2 As per claim 17, **Jacques, Raeth et al.** and **Werbos** teach the controller of claim 14. **Jacques** does not expressly teach that each model is used to predict, at a current time t, a future state of the multiple actuator-sensor smart matter dynamic control system at a later time ($t+\Delta t$): $x_t(t + \Delta; x(t), u(t))$. **Raeth et al.** teaches that each model is used to predict, at a current time t, a future state of the multiple actuator-sensor smart matter dynamic control system at a later time

(t+Δt): x_t (t + Δ; x(t), u(t)) (Page 1, Para 0012; Page 1, Para 0011), because that allows the parameter values with the dynamic controller to evolve over iterations for developing effective predictions of the next samples in the data stream (Page 2, Para 0013). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the controller of **Jacques** with the controller of **Raeth et al.** that included each model being used to predict, at a current time t, a future state of the multiple actuator-sensor smart matter dynamic control system at a later time (t+Δt): x_t (t + Δ; x(t), u(t)). The artisan would have been motivated because that would allow the parameter values with the dynamic controller to evolve over iterations for developing effective predictions of the next samples in the data stream.

13.3 As per Claims 1 and 9, these are rejected based on the same reasoning as Claim 14, supra. Claims 1 and 9 are a method claim and a means claim reciting the same limitations as Claim 14, as taught throughout by **Jacques, Raeth et al.** and **Werbos**.

13.4 As per claims 6 and 7, **Jacques, Raeth et al.** and **Werbos** teach the method of claim 1. **Jacques** does not expressly teach including repeating the steps within one or more selectable time periods; and including the sum of prediction error over a finite interval. **Raeth et al.** teaches including repeating the steps within one or more selectable time periods; and including the sum of prediction error over a finite interval (Page 2, Para 0018; Page 2, Para 0015), because that allows the parameter values with the dynamic controller to evolve over iterations for developing effective predictions of the next samples in the data stream (Page 2, Para 0013). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to

modify the method of **Jacques** with the method of **Raeth et al.** that included including repeating the steps within one or more selectable time periods; and including the sum of prediction error over a finite interval. The artisan would have been motivated because that would allow the parameter values with the dynamic controller to evolve over iterations for developing effective predictions of the next samples in the data stream.

14. Claims 2, 8, 10 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jacques** (U.S. Patent Application 2003/0028266) in view of **Raeth et al.** (U.S. Patent Application 2003/0065409), and further in view of **Werbos** (U.S. Patent 6,581,048) and **Black et al.** (U.S. Patent 5,802,203).

14.1 As per claim 15, **Jacques, Raeth et al.** and **Werbos** teach the controller of claim 14. **Jacques** does not expressly teach that the plurality of control system models comprises N control system models; and each of the N control system models is initially assigned a weight w_i such that $\Sigma_{i=1}^{N} w_i = 1$. **Black et al.** teaches that the plurality of control system models comprises N control system models; and each of the N control system models is initially assigned a weight w_i such that $\Sigma_{i=1}^{N} w_i = 1$ (CL7, L62-65; CL9, L4-7), because that allows the sum of all residuals to be as small as possible (CL5, L52-55); and the controller then achieves convergence quickly (CL9, L11-12). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the controller of **Jacques** with the controller of **Black et al.** that included the plurality of control system models comprising N control system models; and each of the N control system models being initially assigned a weight w_i such that $\Sigma_{i=1}^{N} w_i = 1$. The

artisan would have been motivated because that would allow the sum of all residuals to be as small as possible; and the controller would then achieve convergence quickly.

14.2 As per Claims 2 and 10, these are rejected based on the same reasoning as Claim 15, supra. Claims 2 and 10 are a method claim and a means claim reciting the same limitations as Claim 15, as taught throughout by **Jacques, Raeth et al., Werbos** and **Black et al.**

14.3 As per claim 8, **Jacques, Raeth et al.** and **Werbos** teach the method of claim 1. **Jacques** does not expressly teach including the actuation and the error to weight new models. **Black et al.** teaches including the actuation and the error to weight new models (CL7, L62-65; CL9, L4-7), because that allows the sum of all residuals to be as small as possible (CL5, L52-55); and the controller then achieves convergence quickly (CL9, L11-12). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Jacques** with the method of **Black et al.** that included including the actuation and the error to weight new models. The artisan would have been motivated because that would allow the sum of all residuals to be as small as possible; and the controller would then achieve convergence quickly.

15. Claims 11 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jacques** (U.S. Patent Application 2003/0028266) in view of **Raeth et al.** (U.S. Patent Application 2003/0065409), and further in view of **Werbos** (U.S. Patent 6,581,048) and **Shutic et al.** (U.S. Patent 6,361,605).

15.1 As per claim 16, **Jacques, Raeth et al.** and **Werbos** teach the controller of claim 14. **Jacques** does not expressly teach that using an i^{th} model includes investing a certain fraction a_i of the weight w_i, of the i^{th} model, where $0 < a_i < 1$. **Shutic et al.** teaches that using an i^{th} model includes investing a certain fraction a_i of the weight w_i, of the i^{th} model, where $0 < a_i < 1$ (CL20, L41-60), because as per **Werbos** that allows specifying models with weights which can be adapted to make the model a good approximation; if it adapts over time, it learns; and the learning mechanism tries to minimize prediction errors (CL7, L42-46; CL18, L3-5). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the controller of **Jacques** with the controller of **Shutic et al.** that included using an i^{th} model including investing a certain fraction a_i of the weight w_i, of the i^{th} model, where $0 < a_i < 1$. The artisan would have been motivated because that would allow specifying models with weights which can be adapted to make the model a good approximation; if it adapts over time, it learns; and the learning mechanism tries to minimize prediction errors.

15.2 As per Claim 11, it is rejected based on the same reasoning as Claim 16, supra. Claim 11 is a means claim reciting the same limitations as Claim 16, as taught throughout by **Jacques, Raeth et al., Werbos** and **Shutic et al.**

16. Claims 3, 4, 5, 13 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jacques** (U.S. Patent Application 2003/0028266) in view of **Raeth et al.** (U.S. Patent Application 2003/0065409), and further in view of **Werbos** (U.S. Patent 6,581,048), **Black et al.** (U.S. Patent 5,802,203) and **Shutic et al.** (U.S. Patent 6,361,605).

16.1 As per claim 18, **Jacques, Raeth et al., Werbos** and **Shutic et al.** teach the controller of claim 16. **Jacques** does not expressly teach that the invested amount is split between the N models according to the formula $w_i^{new} = (1\text{-}a)\ w_i^{old} + a\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}^{N}(\ 1/\ (e_i^2 + \sigma^2)))]$. **Black et al.** teaches that the invested amount is split between the N models according to the formula $w_i^{new} = (1\text{-}a)\ w_i^{old} + a\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}^{N}(\ 1/\ (e_i^2 + \sigma^2)))]$ (CL6, L26-54; CL7, L27-54), because that allows the sum of all residuals to be as small as possible (CL5, L52-55); and the controller then achieves convergence quickly (CL9, L11-12). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Jacques** with the method of **Black et al.** that included that the invested amount being split between the N models according to the formula $w_i^{new} = (1\text{-}a)\ w_i^{old} + a\ [(\ 1/\ (e_i^2 + \sigma^2))\ /\ (\Sigma_{i=1}^{N}(\ 1/\ (e_i^2 + \sigma^2)))]$. The artisan would have been motivated because that would allow the sum of all residuals to be as small as possible; and the controller would then achieve convergence quickly.

16.2 As per Claims 5 and 13, these are rejected based on the same reasoning as Claim 18, supra. Claims 5 and 13 are a method claim and a means claim reciting the same limitations as Claim 18, as taught throughout by **Jacques, Raeth et al., Werbos, Shutic et al.** and **Black et al.**

16.3 As per claim 3, **Jacques, Raeth et al., Werbos** and **Black et al.** teach the method of claim 2. **Jacques** does not expressly teach that using an i^{th} model includes investing a certain fraction a_i of the weight w_i, of the i^{th} model, where $0 < a_i < 1$. **Shutic et al.** teaches that using an i^{th} model includes investing a certain fraction a_i of the weight w_i, of the i^{th} model, where $0 < a_i <$

1 (CL20, L41-60). The motivation for combining **Jacques** with **Shutic et al.** is provided in Paragraph 15.1 above.

16.4 As per claim 4, **Jacques, Raeth et al., Werbos, Shutic et al.** and **Black et al.** teach the method of claim 3. **Jacques** does not expressly teach that each model is used to predict, at a current time t, a future state of the multiple actuator-sensor smart matter dynamic control system at a later time $(t+\Delta t)$: $x_t\,(t + \Delta;\, x(t), u(t))$. **Raeth et al.** teaches that each model is used to predict, at a current time t, a future state of the multiple actuator-sensor smart matter dynamic control system at a later time $(t+\Delta t)$: $x_t\,(t + \Delta;\, x(t), u(t))$ (Page 1, Para 0012; Page 1, Para 0011). The motivation for combining **Jacques** with **Raeth et al.** is provided in Paragraph 13.2 above.

Conclusion

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on 571-272-3716. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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